

WHAT IS CLAIMED IS:

1. A stack-integrated optical transceiver, by using a stack-integration package structure of a light emitting device and a photodetector for high speed, full duplex optical fiber communication, comprising:

5 a photodetector, has on its upper surface an isolated, U-shaped cavity that is conformal-coated first with an electrically insulating layer and then with an optically reflective and electrically conducting metal layer;

10 a light emitting device, stacked at the bottom inside the U-shaped cavity using conventional die bonding process to form with the photodetector a hybrid chip of stack-integrated embodiment;

a conformal coated metal layer, serves multiple purposes at once; providing for electrical interconnection from the bottom of the U-shaped cavity to a wire-bonding pad on the photodetector surface and form a
15 reflective cavity metal surface for preventing direct optical crosstalk from the light emitter to the detector and optimally reflects light from the emitter in the desired direction;

said reflective cavity metal surface also provides a larger effective light emitting area and facilitates optical coupling to the connected fiber.
20

2. A stack-integrated optical transceiver as recited in claim 1, wherein said die bonding of the light emitting device inside the cavity in the photodetector can be electrically conductive to said conformal coated metal layer, resulting in a 3-terminal stack-integrated transceiver package,
25 or said die bonding can be electrically non-conductive so that the whole embodiment of the stack-integrated hybrid chip forms a 4-terminal transceiver package where the emitter and the detector are electrically isolated completely.

3. A stack-integrated optical transceiver as recited in claim 1, wherein said photodetector is fabricated on Silicon or Gallium Arsenic substrate.

4. A stack-integrated optical transceiver as recited in claim 1,
5 wherein said photodetector means semiconductor photodiodes.

5. A stack-integrated optical transceiver as recited in claim 1, wherein said light emitting device means laser diode, specifically vertical emitting laser diode, or light emitting diode.

6. A stack-integrated optical transceiver, by using a stack-
10 integration package structure of a light emitting device and a photodetector for high speed, full duplex optical fiber communication, comprising:

a photodetector has on its upper surface an isolated, U-shaped cavity that is conformal-coated first with an electrically insulating layer and then with an optically reflective and electrically conducting metal
15 layer;

a light emitter is stacked at the bottom inside the U-shaped cavity using conventional die bonding process to form with the photodetector as a hybrid chip of stack-integrated embodiment;

The stack-integrated hybrid chip is further characterized by a
20 specific package whereby an optically clear encapsulation of specifically shaped lens surface is provided for light transmission from and to the stack-integrated hybrid chip, such that Fresnel reflection at the encapsulation-air interface reflects light from the emitter retrospectively back toward the emitter vicinity, so that optical crosstalk from the emitter
25 device to the photodiode device within the transceiver package is avoided or minimized.

7. A stack-integrated optical transceiver as recited in claim 6,
wherein said U-shaped cavity for placement of said light emitting device is
centrally surrounded by the optically active region of said photodetector so
that both said light emitting device and said photodetector are aligned to
5 the same optical axis as said optically clear encapsulation for optimal
optoelectronic coupling effect.

8. A stack-integrated optical transceiver as recited in claim 6,
wherein said specifically shaped lens surface of said optically clear
encapsulation of the transceiver means specifically a hemispherical shape
10 in the extended optical space of the light path from said light emitter which
is located at the center of the optically clear hemispherical encapsulation.

9. A stack-integrated optical transceiver as recited in claim 6,
wherein said optically clear encapsulation of the stack-integrated hybrid
chip is made specifically of clear-type epoxy molding.

15